TEACHER TRAINING MANUAL

MULTIMEDIA APPLICATIONS FOR EDUCATION

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PART ONE / A

INTRODUCTION

Chapter One:
Introduction to e-learning

Vilnius Pedagogical University **(LT)**

1. Introduction

The technology is improving, and users often feel, that it becomes part of their world. People are realizing that e-learning is applicable to so much more than learning. E-communication becomes part of the life.

Until well into the 20th century most workers were manual workers. Today only about 20% do manual work. Nearly half, 40% of total work force, are knowledge workers. Preparing children, teens, and adults to function in this situation is a top priority of society. The development and expansion of the Internet and distance learning are essential to achieving this goal. The e-learning industry is one of the fastest-growing areas of the high-technology sector and will continue this trend far into the future. Yet there is a great deal of confusion surrounding e-learning for learners, investors and sometimes even for instructors.

Confusion concerning e-learning comes from using the word "e-learning" to describe anything and everything within this very wide industry. E-learning is a generic term that covers a variety of forms of electronic mediated learning. E-learning is more than "e-training." Usually e-learning is defined as "asynchronous or synchronous learning that is conducted over the Internet, intranet, extranet or other Internet-based technologies. E-learning includes a number of different delivery methodologies within it including self-paced content, virtual classrooms, simulations, online chats, threaded discussions, etc."

E-learning has definite technical and pragmatic benefits[1] over traditional classroom training. ***E-learning wins against face-to-face learning because of "better - faster – cheaper" reasons:***

- It's ***flexible***.
- It's ***less expensive*** because of not having to travel or spend excess time away from work. The biggest benefit of e-learning, however, is that it eliminates the expense and inconvenience of getting the instructor and students in the same place.
- It provides a quality product at a lower cost – it's ***less expensive to produce.***
- E-learning provides a ***consistent*** message. It helps to save time and money on not learning of extra material. The objective is to ***become competent in the least time and with the least amount of training.***
- E-learning is delivered in the ***right-sized pieces***. Learners don't have to take a one-hour class for the five minutes' worth of content they are looking for.
- It's ***self-paced***. Most e-learning programs can be taken when needed. It helps to save is time. Speed is a well-known competitive advantage, and not even in business.
- It can work from ***any location and any time***. It serves as an equalizer in terms of access and equity.
- It can be ***updated easily*** and quickly.

[1] Rosenberg M. E-Learning: Strategies for Delivering Knowledge in the Digital Age. -McGraw-Hill, 2000, p. 29-30.

- It can be easily managed for large groups of students and ***use the work of the best instructors.***
- It can ***use an extensive collection of resources***.

Web-based products allow instructors to update lessons and materials across the entire network instantly. This ***keeps content fresh*** and consistent and gives students immediate access to the most current data. Information can be retrieved just before it is required, rather than being learned once in a classroom and subsequently forgotten.

The Internet provides ***new channels*** and forums to support learning. These include online mentoring, chat, message boards or threaded discussions, e-mail, synchronous training events, etc. These components make the difference between a flat, one-dimensional learning experience and one that ***is rich in diversity and choice***.

Online training is less intimidating, more psychologically "safe" than instructor-led courses. Students taking an online course enter a risk-free environment in which they can try new things and make mistakes without exposing themselves. People feel safer, if nobody sees their mistakes. This characteristic is particularly valuable when trying to learn soft skills, such as leadership and decision-making. A good learning program shows the consequences of students' actions and where and why they went wrong. After a failure, students can go back and try again. This type of learning experience eliminates the embarrassment of failure in front of a group.

Modern philosopher of education M.Lipman[2] set two contrasting paradigms of educational practice – ***the standard paradigm*** of normal practice (mostly performed by face – to – face education) and ***reflective paradigm*** of critical practice (educational principles of e – learning is based on this approach).

The dominating assumptions of the standard paradigm are:	**The dominating assumptions of the reflective paradigm are:**
Education consists in the transmission of knowledge from teacher to learner.	Education is the outcome of participation in teacher – guided learners community.
Learners acquire knowledge by absorbing information, and the facts are the main goal of education.	The focus of educational process is on the grasp of relationships within the subject matter under investigations.
Knowledge is about the world, and this knowledge is unambiguous and unmysterious.	Learners are stirred to think about the world, and knowledge reveal to learners as ambiguous and mysterious.
Knowledge is distributed among disciplines that are non-overlapping, and together are exhaustive of the world to be known.	Getting of knowledge is based not on disciplines, but on problems. The knowledge from different science is required to solve the problem
The teacher plays an authoritative role.	Teachers role is supportive and fallibilistic (ready to concede error).

Distance learning can not only satisfy the demand for alternative forms of education. E-learning leads to increased retention and a stronger grasp on the subject, ***helps to organize more successful learning process***:

- ***Learner-centric approach***. E-learning is the shift from instructor-centric to learner-centric approach. For years, training has organized itself for the convenience and needs of instructors, institutions, and bureaucracies. ***E-learning focuses on the individual learner.***
- Making the learner central to the teaching process has been long established history - which includes being pilloried under the heading of 'progressive education' by many educators and politicians. What it implies is a respect for the learner as an individual who has different needs and expectations. For example,

2 Lipman M. Thinking in Education. – Cambridge, 1991, p. 14.

the need to feel included in the learning process and empowered by the ideas developed. It is a process that aims to facilitate intrinsic motivation in which the learning itself is the main reward. One way of the key differences is the extent to which learners are dependent on the tutor or the learning materials - and there can be good reasons for both approaches.

- Most people a familiar with the traditional education, where lecturer stands in the centre and passes the knowledge all around. People, who are further, find it easier to "catch" what is being passed. But those who are far away, find it more difficult, they "catch" the wrong things or simply get buried. It is however a familiar learning environment for most people.
- E-learning does provide the opportunity to revisit what the style of a learning environment could and should be. Here ***people may learn in different ways***, such as individually and collaboratively in small groups - but always on the move in the direction ***that best suits them***.
- An e-learning program can boast the latest technology available, but if it fails to meet the needs, it doesn't matter how advanced it is or how much money is saved. A good e-learning experience does not take a one-size-fits-all approach. Instead it focuses on learner and can engage the program and meet everybody's learning objectives.
- The introduction to the course usually takes into account the learners' backgrounds, ability levels, and expectations, including their personal learning goals and objectives, or specifies the attributes of the learners for whom the course is designed.

2. Personalization

There are many different learning styles[3]. For example, ***active and reflective learners***. Active learners tend to retain and understand information best by doing something active with it - discussing, applying, or explaining it to others. They like group work. Sitting through lectures without getting to do anything physical but note taking is for them very hard. Reflective learners prefer to think about it quietly first. They prefer to work alone.

Visual and verbal learners. Visual learners remember best what they have seen - pictures, diagrams, time lines, films, and demonstrations. Most people are visual learners. Verbal learners get more out of words - written and spoken explanations.

Everyone learns more when information is presented both visually and verbally.

Rational and intuitive learners. Rational learners tend to like learning facts, like solving problems by well-established methods and dislike complications. Intuitive learners often prefer discovering possibilities and relationships, like innovation and dislike repetition.

Sequential and global learners. Sequential learners tend to gain understanding in linear steps, with each step following logically on from the previous one. Sequential learners tend to follow logical stepwise paths in finding solutions. Global learners tend to learn in large jumps, absorbing material almost randomly without seeing connections, and then suddenly "getting it." Global learners may be able to solve complex problems quickly or put things together in novel ways once they have grasped the big picture, but they may have difficulty explaining how they did it.

One time learners and repeaters. Onetime learners spend more time reading and put more efforts on material analysing. But they do it once – after don't "come back". Repeaters like to re - read parts of content, they many times "come back" on pieces they liked most of all or on pieces they don't understood well enough.

3 Felder R.M., Solomon B.A. Cognitive styles and learning strategies. – London, 2002.

There may be detected more learning styles and strategies. E-learning tries to support all individual learning styles. Whether learner thrive in a highly interactive environment or prefer solitude, learning program should provide components that accommodate individual approach to learning. This allows learner to tap into the resources with which they are most comfortable, resulting in greater knowledge retention.

E-learning accepts and encourages independent thinking, autonomy and initiative. Learners attain their own intellectual identity, and have possibility to become autonomous thinkers, who do not merely parrot what others say think and do, but make their own judgments, form their own understanding of the world. Autonomous thinkers develop their own conceptions of the sort of persons they want to be, and the sort of world they would like it to be.

Many elements are combined in e-learning to reinforce the message, such as video, audio, quizzes, interaction, etc. There is also the ability to revisit or replay sections of the training that might not have been clear the first time around.

3. Motivation

Traditional learning often tries to get students to learn solutions rather than investigate the problems and engage the inquiry for themselves. Learners just have to study the end results of what the others have discovered. Traditional learning neglect the process and stresses up on the results and products. ***When problems are not explored, no interest or motivation is engendered***, and education becomes imitation and repeating.

Modern educators propose, that learning process should take as its model the process of scientific inquiry. Then learners will be intrinsically motivated to learn if there is a meaningful nature of the learning environment and activities.

4. Responsibility

Students get higher retention of content through personalized learning. Since they can customize the learning material to their own needs, students have more control over their learning process and can better understand the material, leading to a faster learning curve.

Learner-centric scenario requires people ***to take on personal responsibility for their own learning***. It can be a more daunting experience for those whose experience of learning is limited to the expert on the mountain - and they need help and support to make the change. E-learners are responsible for their own learning. E-learning empowers them to manage and implement their own learning and development plans.

Self assessment. Learners should be able to track and evaluate their own progress, using self-tests, similar to the final evaluation instruments. Learning is effective only in circumstances of self-critical practice, which entails the self-correction[4].

5. Interactiveness

Most ***learning is social***. The coffee room is a more effective place to learn than the classroom. Studies reveal that the majority of corporate learning is informal, i.e. outside of class. E-learning seeks to foster collaboration and peer interaction.

Online learning should not sacrifice the human element that is so important to learning experience. Programs should offer ***online communities*** for peer-to-peer collaboration and coaching or mentoring from industry veterans and experts. Students should be engaged in dialogue with the tutor/teacher and with each other.

[4] Chapnick S., Meloy J. Renaissance eLearning: Creating Dramatic and Unconventional Learning Experiences. - Pfeiffer, 2005, p. 36-37.

Students are engaged in experiences that challenge and encourage discussion[5]. ***Discussion helps students to grow cognitively - adopt new ideas***, enables students to show that they understand. However, only when they feel comfortable enough to express their ideas will meaningful dialogue occur.

Most e-learning is project-based and occur in a group context. Conducting their own projects is much more interesting to students then answering sterile textbook problems. And because they get to define the nature of the project (even if they don't choose the topic), they have a sense of control over their learning which is absent in traditional classroom instruction. The authentic learning context of the project increases student motivation and satisfaction.

E-learning helps to create successful collaborative teams, emphasizes team efforts that involve communication and social skills, encourages respect for each others ideas. Research on collaborative learning suggests that in the process of collaboration, students are forced to clarify and ***verbalize their problems, plane, manage and facilitating solutions***. Furthermore, when students work in teams, they often have the opportunity to work with others from quite different backgrounds and this facilitates an understanding of diversity and multiple perspectives.

Distance education can be more stimulating and encourage more critical reasoning than a traditional large instructor-led class because it allows the kind of interaction that takes place most fully in small group settings. Online students had more peer contact with others in the class, enjoyed it more, spent more time on class work, understood and performed the material better.

6. Higher order thinking

Of course, traditional education involved thinking, but the quality of such thinking was deficient. E-learning involves active cognitive processes, such as creating, problem-solving, reasoning, decision-making, and evaluation. Students must connect and summarize concepts by analyzing, predicting, justifying and defending their ideas. Higher order thinking is a term about quality, not about the quantity. Higher order thinking, learners may develop in e-learning process, is conceptually rich, coherently organized and persistently exploratory, resourceful and flexible. Higher order thinking is a fusion of creative and critical thinking, where those two aspects supports and reinforce each other, as when the critical thinker invents new premises or new criteria, and creative thinker gives a new twist to tradition or convention. Such complex thinking is prepared to recognize the factors that make for bias, prejudices and self-deception (it is important in sociocultural, moral, psychological education). It involves thinking not about its subject matter, but about its procedures at the same time. B.S.Bloom (***in Taxonomy of Educational Objectives***) generated pyramid or hierarchy of skills, at the apex of which are ***analysis, synthesis and evaluation***. If by "analysis" is meant critical thinking, by "synthesis" is meant creative thinking, and if by "evaluation" is meant judgments, these skills may be called the main components of higher order thinking.

Purpose of higher order thinking is not to help decide what to believe. ***The role of higher order thinking is defensive*** – to protect people from being coerced or brainwashed into believing what others want to compel us to believe without having an opportunity to inquire for themselves[6].

7. Life-long education

E-learning is forever. E-learning is continuous education, the forty-year degree. It is a daily learning. Work becomes learning, learning becomes work, and nobody ever graduates.

[5] Splitter L.J, Sharp A.M. Teaching for better thinking. – ACER, 1995, p. 36- 38.

6 Lipman M. Thinking in Education. – Cambridge, 1991., p. 19-23.

There may be many ***different forms of e-learning*** - Live e-Learning, Instructor-led, Online, Self-study or informal learning, Computer games, etc, and Blended.

Live e-learning (also referred to as instructor-led training through the Internet) is the newest method of presenting training. Many people prefer learning with an instructor but cannot afford the cost or time to travel to a classroom. Other times, people in widely dispersed locations need to be trained simultaneously within a short period of time, with company specifics integrated into the course by the instructor. Live e-learning is a viable solution for these and other training situations. Live e-learning is instructor-led training conducted through the Internet (or company intranet) within a virtual classroom. Live instructor with excellent knowledge of the topic being taught might provide additional insight into the topic based on questions asked by learners in attendance

If you are expected by the instructor and your employer to be in a class all day for three to five consecutive days, you will probably finish the course faster than if you use self-paced e-learning, unless your employer permits you to devote the same work hours to taking a self-paced class. But live e-learning is more expensive than self-paced e-learning. After all, you have a live instructor or the benefits of a live instructor present at all times. Second, live e-learning can require much more network bandwidth than self-paced training because of its audio, video and collaboration capabilities.

8. Informal learning

Informal learning is perhaps the most dynamic and versatile aspect of learning. Unfortunately, it is the least recognized. Learners need for information (and how we intend to use it) drives the search. Search engines (like Google) coupled with information storage tools (like Furl) and personal knowledge management tools like wikis and blogs present a powerful toolset in the knowledge workers portfolio. Peoples usually discover how to do jobs through informal learning -- observing others, asking the person in the next cubicle, calling the help desk, trial-and-error, and simply working with people in the know.

9. Blended learning

E-learning can’t replace everything. Solution may be the blended learning format. ***Blended learning*** is a term now widely used to describe myriad combinations of learning experiences. Blended learning gives permission to combine learning ingredients in new and creative ways to satisfy the tastes of every learner. Blended learning gives everyone the opportunity to shape programs to meet specific needs and goals.

Blended learning provides the best opportunities for learning transition from classroom to e-learning. Blended learning involves classroom (or face-to-face) and online learning. This method is very effective for adding efficiency to classroom instruction and permitting increased discussion or information review outside of classrooms. Learning is a social process, requiring instructor direction and facilitation. Blended learning utilizes the best of classrooms with the best of online learning.

Chapter Two
The application of multimedia solutions to education

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1 . Multimedia systems in education

As clearly explained by Vaérie Gyselinck of the Laboratory for Experimental Psychology of the Université René Descartes (France)7, *Multimedia systems are developing quickly and will continue to do so in the near future, especially in instructional fields. A multimedia system typically requires the integration of different types of information: verbal information presented visually or auditorily (e.g. words, sentences, or short texts), pictorial information presented visually in a static or dynamic way (illustrations, photographs, schemas), and sound information.*

Systems that allow users to navigate between different sources of information with the use of hypertext structures are often considered to be multimedia systems, even if only one type of information is provided (for example, verbal information presented visually). The development of technologies is intended to provide the users with quick and easy access to a large amount of information and a choice between different forms of presentations. Thanks to multimedia systems, the instructional process can be made more flexible, rich, and individualized.

From a psychological point of view, however, the question arises as to what extent the use of all these overelaborate systems are beneficial to the learning process. The temptation is strong to simply assume that using multiple forms of displaying information, using realistic and vivid presentations, and providing multiple possibilities to interact with a learning system results generally in better learning (Schnotz, 1999a). Despite all technical innovations, however, the acquisition of information through any technical system is subject to the constraints of human information processing. Thus, people involved in the creation and use of this kind of material must then consider a series of relevant questions. In particular, thought must be given to how various sources of information have to be integrated by the user, either simultaneously or successively. This holds true across whatever goal the user has: either instructional, professional, amusement, or other. Further, one has to consider to what extent the user is able to integrate different types of information. For instance, which rules guide selecting the number and nature of simultaneously presented information? What are the sources of individual differences in processing ability from multimedia systems?

Our goal is to try to demonstrate that jet it is avaible to all teachers a form of multimedia text that gives answer to all those theoretical questions, and it is what today we simply call "videogames".

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[7] In Herre van Oostendorp (Editor), Cognition in a Digital World, Lawrence Erlbaum Associates, 2002

Chapter Three
Videogames and education

University of Fine Arts of Brera (IT)

1. Videogames: a new literacy

Actually there is a book published in 2002 in the U.S.A. that clearly explore and explain the subject of the encounter between videogames and education: *What videogames have to teach us about learning and literacy*[8]. His author, James Paul Gee, thinks that videogames represents a new form of semiotic domain and emerging literacy, and also a new way to learn: as written by Jason Craft in his review of the book[9], *Gee asserts that video games teach very well . . . indeed, better than our decontextualized, skill-and-drill classrooms. If meaning is situated within, and literacy occurs within, the context of semiotic domains (the term Gee uses for distinct and embodied contexts, matrices of environmental attributes and, crucially, social practices in which signs are given a distinct meaning, and in which a person can be literate), then video games present simulated semiotic domains and give information an embodied and contextualized presence that lends itself better to how we are psychologically structured to learn.*

This learning is situated not only within the game but around it: the practice of learning a video game is an enculturation practice that involves not only learning the mechanics of gameplay, but learning how to negotiate the context of play, the terms and practices of a game's players, and the design choices of its developers. These levels of engagement are what Gee calls, respectively, internal and external design grammars for a given domain. These design grammars are present in any given semiotic domain--from a basketball game to an archaeological dig--and video games, according to Gee, allow gamers to simulate, learn, and manage design grammars in a way that traditional teaching practices do not.

This points to Gee's second argumentative thread, which is, I believe, the more compelling: video games "situate meaning in a multimodal space through embodied experiences to solve problems and reflect on the intricacies of the design of imagined worlds and the design of both real and imagined social relationships in the modern world". Video games simulate identities, experiences, contexts, and social relationships in designed spaces. A player learns to think critically about the simulation while at the same time gaining embodied knowledge through interacting with it: taking on new avatarial identities within it, solving problems through trial and error within it, and gaining expertise, or literacy, within it.

Gee is not arguing that video games are ready to replace standard classroom instruction. At this point in time, video games primarily teach themselves: a player learns how to navigate the game's territory, how to solve game-specific puzzles, how to kill the "boss" at the end of the game. But Gee stresses that his argument pertains to "the potential of video games", and believes that the method of instruction embodied in video games has potential for non-self-referential disciplines, particularly science.

It is very interesting how James Pail Gee start to tell how he began to play videogames with his son: *When I played the game I was quite surprised to find out it was fairly long*

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[8] Gee, James Paul. *What Video Games Have to Teach Us About Learning and Literacy*. New York: Palgrave Macmillan, 2003

[9] Jason Craft, A Review of What Video Games Have to Teach Us about Learning and Literacy, in Currents In Electronic Literacy, http://www.cwrl.utexas.edu/currents/fall04/craft.html

and pretty challenging, even for an adult. Yet a four-year-old was willing to put in this time and face this challenge—and enjoy it, to boot. I thought, as someone who has worked in the second half of his career in education (the first half was devoted to theoretical linguistics), "Wouldn't it be great if kids were willing to put in this much time on task on such challenging material in school and enjoy it so much?" So I decided to buy and play an adult game ("adult" here means the game is played by teenagers on up; video-game players tend to be anywhere between 3 years old and 39). I somewhat arbitrarily picked the game The New Adventures of the Time Machine, a game involving adventure, problem solving, and shooting (based loosely on H. G. Wells), knowing nearly nothing about video games. Little did I know what I was getting myself into. This game, like nearly all such games, takes a great many hours to play. Many good video games can take 50 to 100 hours to win, even for good players. Furthermore, it was—for me—profoundly difficult.

In fact, this was my first revelation. This game—and this turned out to be true of video games more generally—requires the player to learn and think in ways in which I am not adept. Suddenly all my baby-boomer ways of learning and thinking, for which I had heretofore received ample rewards, did not work.

My second realization came soon after, when at the end of a day in which I had played Time Machine for eight straight hours, I found myself at a party, with a splitting headache from too much video motion, sitting next to a 300- pound plasma physicist. I heard myself telling the physicist that I found playing Time Machine a "life-enhancing experience," without even knowing what I meant by that. Fortunately, plasma physicists are extremely tolerant of human variation. (The plasma that physicists deal with is not, as he told me, a product from blood but a state of matter; when I asked him why he had not brought any to the party, he explained to me that plasma is so unstable and dangerous that if he had brought any, there would have been no party.) Oddly enough, then, confronting what was, for me, a new form of learning and thinking was both frustrating and life enhancing. This was a state that I could remember from my days in graduate school and earlier in my career (and when I changed careers midstream). Having long routinized my ways of learning and thinking, however, I had forgotten this state. It brought back home to me, forcefully, that learning is or should be both frustratingand life enhancing. The key is finding ways to make hard things life enhancing so that people keep going and don't fall back on learning and thinking only what is simple and easy.

My third realization followed from these other two. I eventually finished The New Adventures of the Time Machine and moved onto Deus Ex, a game I chose because it had won Game of the Year on many Internet game sites. Deus Ex is yet longer and harder than Time Machine. I found myself asking the following question: "How, in heaven's name, do they sell many of these games when they are so long and hard?" I soon discovered, of course, that good video games (like Deus Ex) sell millions of copies. Indeed, the video-game industry makes as much or more money each year than the film industry.

Gee thinks that *WHEN PEOPLE LEARN TO PLAY VIDEO GAMES, THEY ARE LEARNING A NEW LITERACY. Of course, this is not the way the word "literacy" is normally used. Traditionally, people think of literacy as the ability to read and write. Why, then, should we think of literacy more broadly, in regard to video games or anything else, for that matter? There are two reasons.*

First, in the modern world, language is not the only important communicational system. Today images, symbols, graphs, diagrams, artifacts, and many other visual symbols are particularly significant. Thus, the idea of different types of "visual literacy" would seem to be an important one. For example, being able to "read" the images in advertising is one type of visual literacy. And, of course, there are different ways to read such images, ways that are more or less aligned with the intentions and interests of the advertisers. Knowing how to read interior designs in homes, modernist art in museums, and videos on MTV are other forms of visual literacy.

Furthermore, very often today words and images of various sorts are juxtaposed and integrated in a variety of ways. In newspaper and magazines as well as in textbooks,

images take up more and more of the space alongside words. In fact, in many modern high school and college textbooks in the sciences images not only take up more space, they no carry meanings that are independent of the words in the text. If y o u can't read these images, you will not be able to recover their meanings from the words in the text as was more usual in the past.
In such multimodal texts (texts that mix words and images), the images often communicate different things from the words. And the combination of the two modes communicates things that neither of the modes does separately.
Thus, the idea of different sorts of multimodal literacy seems an important one. Both modes and multimodality go far beyond images and words to include sounds, music, movement, bodily sensations, and smells.
Gee is convinced that *playing video games actively and critically is not "awaste of time." And people playing video games are indeed (pace the six-year old's grandfather), learning "content," albeit usually not the passive content of school-based facts. (Many games, such as the Civilization games, do contain a good number of facts.) The content of video games, when they are played actively and critically, is something like this: They situate meaning in a multimodal space through embodied experiences to solve problems and reflect on the intricacies of the design of imagined worlds and the design of both real and imagined social relationships and identities in the modern world. That's not at all that bad—and people get wildly entertained to boot. No wonder it is hard for today'sschools to compete.*

Within his book, Gee states 36 Learning Principle each one in a way that is intended to be equally relevant to learning in video games and learning in content areas in classrooms.

2. Gee's 36 Learning Principles

1. Active, Critical Learning Principle
All aspects of the learning environment (including the ways in which the semiotic domain is designed and presented) are set up to encourage active and critical, not passive, learning.

2. Design Principle
Learning about and coming to appreciate design and design principles is core to the learning experience.

3. Semiotic Principle
Learning about and coming to appreciate interrelations within and across multiple sign systems (images, words, actions, symbols, artifacts, etc.) as a complex system is core to the learning experience.

4. Semiotic Domains Principle
Learning involves mastering, at some level, semiotic domains, and being able to participate, at some level, in the affinity group or groups connected to them.

5. Metalevel Thinking about Semiotic Domains Principle
Learning involves active and critical thinking about the relationships of the semiotic domain being learned to other semiotic domains.

6. "Psychosocial Moratorium" Principle
Learners can take risks in a space where real-world consequences are lowered.

7. Committed Learning Principle

Learners participate in an extended engagement (lots of effort and practice) as extensions of their real-world identities in relation to a virtual identity to which they feel some commitment and a virtual world that they find compelling.

8. Identity Principle
Learning involves taking on and playing with identities in such a way that the learner has real choices (in developing the virtual identity) and ample opportunity to meditate on the relationship between new identities and old ones. There is a tripartite play of identities as learners relate, and reflect on, their multiple real-world identities, a virtual identity, and a projective identity.

9. Self-Knowledge Principle
The virtual world is constructed in such a way that learners learn not only about the domain but about themselves and their current and potential capacities.

10. Amplification of Input Principle
For a little input, learners get a lot of output.

11. Achievement Principle
For learners of all levels of skill there are intrinsic rewards from the beginning, customized to each learner's level, effort, and growing mastery and signaling the learner's ongoing achievements.

12. Practice Principle
Learners get lots and lots of practice in a context where the practice is not boring (i.e., in a virtual world that is compelling to learners on their own terms and where the learners experience ongoing success). They spend lots of time on task.

13. Ongoing Learning Principle
The distinction between learner and master is vague, since learners, thanks to the operation of the "regime of competence" principle listed next, must, at higher and higher levels, undo their routinized mastery to adapt to new or changed conditions. There are cycles of new learning, automatization, undoing automatization, and new reorganized automatization.

14. "Regime of Competence" Principle
The learner gets ample opportunity to operate within, but at the outer edge of, his or her resources, so that at those points things are felt as challenging but not "undoable."

15. Probing Principle
Learning is a cycle of probing the world (doing something); reflecting in and on this action and, on this basis, forming a hypothesis; reprobing the world to test this hypothesis; and then accepting or rethinking the hypothesis.

16. Multiple Routes Principle
There are multiple ways to make progress or move ahead. This allows learners to make choices, rely on their own strengths and styles of learning and problem solving, while also exploring alternative styles.

17. Situated Meaning Principle
The meanings of signs (words, actions, objects, artifacts, symbols, texts, etc.) are situated in embodied experience. Meanings are not general or decontextulized. Whatever generality meanings come to have is discovered bottom up via embodied experiences.

18. Text Principle

Texts are not understood purely verbally (i.e., only in terms of the definitions of the words in the text and their text-internal relationships to each other) but are understood in terms of embodied experiences. Learners move back and forth between texts and embodied experiences. More purely verbal understanding (reading texts apart from embodied action) comes only when learners have had enough embodied experience in the domain and ample experiences with similar texts.

19. Intertextual Principle
The learner understands texts as a family ("genre") of related texts and understands any one such text in relation to others in the family, but only after having achieved embodied understandings of some texts. Understanding a group of texts as a family (genre) of texts is a large part of what helps the learner make sense of such texts.

20. Multimodal Principle
Meaning and knowledge are built up through various modalities (images, texts, symbols, interactions, abstract design, sound, etc.), not just words.

21. "Material Intelligence" Principle
Thinking, problem solving, and knowledge are "stored" in material objects and the environment. This frees learners to engage their minds with other things while combining the results of their own thinking with the knowledge stored in material objects and the environment to achieve yet more powerful effects.

22. Intuitive Knowledge Principle
Intuitive or tacit knowledge built up in repeated practice and experience, often in association with an affinity group, counts a peat deal and is honored. Not just verbal and conscious knowledge is rewarded.

23. Subset Principle
Learning even at its start takes place in a (simplified) subset of the real domain.

24. Incremental Principle
Learning situations are ordered in the early stages so that earlier cases lead to generalizations that are fruitful for later cases. When learners face more complex cases later, the learning space (the number and type of guesses the learner can make) is constrained by the sorts of fruitful patterns or generalizations the learner has found earlier.

25. Concentrated Sample Principle
The learner sees, especially early on, many more instances of fundamental signs and actions than would be the case in a less controlled sample. Fundamental signs and actions are concentrated in the early stages so that learners get to practice them often and learn them well.

26. Bottom-up Basic Skills Principle
Basic skills are not learned in isolation or out of context; rather, what counts as a basic skill is discovered bottom up by engaging in more and more of the game/domain or game/domains like it Basic skills are genre elements of a given type of game/domain.

27. Explicit Information On-Demand and Just-in-Time Principle
The learner is given explicit information both on-demand and just-in-time, when the learner needs it or just at the point where the information can best be understood an d used in practice.

28 . Discovery Principle
Overt telling is kept to a well-thought-out minimum, allowing ample opportunity for the learner to experiment and make discoveries.

29 . Transfer Principle
Learners are given ample opportunity to practice, and support for, transferring what they have learned earlier to later problems, including problems that require adapting and transforming that earlier learning.

30. Cultural Models about the World Principle
Learning is set up in such a way that learners come to think consciously and reflectively about some of their cultural models regarding the world, without denigration of their identities, abilities, or social affiliations, and juxtapose them to new models that may conflict with or otherwise relate to them in various ways.

31. Cultural Models about Learning Principle
Learning is set up in such a way that learners come to think consciously and reflectively about their cultural models of learning and themselves as learners, without denigration of their identities, abilities, or social affiliations, and juxtapose them to new models of learning and themselves as learners.

32 . Cultural Models about Semiotic Domains Principle
Learning is set up in such a way that learners come to think consciously and reflectively about their cultural models about a particular semiotic domain they are learning, without denigration of their identities, abilities, or social affiliations, and juxtapose them to new models about this domain.

33. Distributed Principle
Meaning/knowledge is distributed across the learner, objects, tools, symbols, technologies, and the environment.

34. Dispersed Principle
Meaning/knowledge is dispersed in the sense that the learner shares it with others outside the domain/game, some of whom the learner may rarely or never see face-to-face.

35. Affinity Group Principle
Learners constitute an "affinity group," that is, a group that is bonded primarily through shared endeavors, goals, and practices and not shared race, gender, nation, ethnicity, or culture.

36. Insider Principle
The learner is an "inside'," "teacher," and "producer" (not just a "consumer") able to customize the learning experience and domain/game from the beginning and throughout the experience.